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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/470,650	12/22/1999	THOMAS A. FIGURA	94-0280.04	6407

7590

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EXAMINER

KILDAY, LISA A

ART UNIT

PAPER NUMBER

2829

DATE MAILED: 10/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/470,650

Applicant(s)

FIGURA ET AL.

Examiner

Lisa A Kilday

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 24 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-8, 10-14, 19, 23, 24, 29-32 and 36-43 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-14, 19, 23, 24, 29-32 and 36-43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 12.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**Priority**

Applicant's specification in 1995 does not support "forming a polymer" in a high density plasma environment. Applicant points out in a selection on pg. 5 lines 17-18 and pg. 6 lines 13-14 where the formation of a polymer is a byproduct of etching. Applicants do not teach the steps of forming a polymer in the high density plasma environment. Applicants cite that a layer may form at a broad range of settings while etching. Therefore, the process of forming a polymer in a high density environment was not described or enabled. 5

For the reasons given above, the applicant is not given the priority date of 06/2/95 for the great-grandparent application 08/458,861 under 35 U.S.C. 120 for claims 1-6, 14, 24, 29-32, 39. Those claims receive the priority date of 1/22/97 at which time one of ordinary skill would have known how to use HDP for polymer deposition from the reference Nulty (5,562,801). Claims 7-8, 10-13, 19, 23, 36-43 receive the priority date of 06/2/95 for the great-grandparent application 08/458,461. } see pg. 2

***If the priority is considered back to 1995, the following 112 rejections are applicable:*** 15

***Claim Rejections - 35 USC § 112***

Claims 1-8, 10-14, 19, 23-24, 29-32, and 36-43 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification as filed in 1995 in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of

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| the claimed invention. Applicant's specification does not disclose the formation of polymer by HDP. Formation of polymer as a byproduct of CF<sub>4</sub> and CHF<sub>3</sub> etchant gases was enabled to one of ordinary skill in 1995. But, polymer formation by HDP was not. The 1995 application similar to the original version of the instant application

5 discloses that polymer means plasma deposited materials such as carbon and halogen.

The inclusion of "or various other material" does not necessarily imply a polymer occurred in the 1997 application. Chemical reactivity is a most unpredictable and empirical art and it is well settled that the requirement that the claims be commensurate in scope with the enabling disclosure is particularly stringent in this area of technology.

| 10 In re Doumani 126 USPQ 408, In re Grant 134 USPQ 248, In re Fisher 166 USPQ 18, Mobil Oil Corporation v. W. R. Grace and Company 180 USPQ 418, In re Slocombe 184 USPQ 740, In re Mercier 185 USPQ 774, Corona Cord Tire Company v. Dovan Chemical Corporation 192 CD 255, See In re Hawkins 174 USPQ 157 (pg. 163) reasoning is sufficient, evidence is not required.

| 5 Claims 1-8, 10-14, 19, 23-24, 29-32, and 36-43 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The 1995 specification has no support for HDP of "various materials." See explanation above.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 7, 13, 36-38 are rejected under 35 U.S.C. 102(b) as being anticipated by John Arnold ("Diagnostic Investigation of Oxide Etching in a Commercial High-Density Plasma Etcher", 49<sup>th</sup> Annual Gaseous Electronics Conference Meeting Program, 10/21/96). Arnold discloses in the abstract forming a polymer in a high-density plasma environment (lines 3-9).

Arnold discloses wherein said step of modifying said polymer further comprises etching a portion of said polymer (line 9).

The method of Arnold has a step of etching a portion of said polymer, which is inherently part of a first and second metallic feature.

Arnold discloses providing a high-density plasma etcher with a plurality of process settings (lines 6-9).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-6, 8, 10-12, 19, 23-24, 29-32, 39-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arnold in view of Nulty (5,562,801). Arnold teaches forming a polymer between a first feature and second feature in a HDP environment (abstract). However, Arnold does not teach wherein plasma-depositing a

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material comprising carbon and a halogen. However Nulty teaches in fig. 10a, 10b, 11 plasma depositing a material (fig. 10a-b) comprising carbon and a halogen (col. 11 lines 19-20, col. 12 lines 13-15). Therefore it would be obvious to one skilled in the art at the time of invention to modify the process of Arnold to plasma-deposit a material comprising carbon and a halogen in order to improve oxide:nitride selectivity.

Arnold teaches forming a polymer by HDP. However, Arnold does not teach wherein plasma-depositing a halogen-free material. However, Nulty teaches wherein plasma-depositing a halogen-free material (col. 3 lines 43-48, col. 15 lines 20-25). Therefore it would be obvious to one skilled in the art at the time of invention to modify the process of Arnold to plasma-deposit a halogen-free material in order to increase polymer formation.

Arnold teaches forming a polymer by HDP. However Arnold does not teach providing a semiconductor device having at least two exposed metal lines. However Nulty teaches at least two exposed metal lines (505, 1105, col. 6 lines 50-55, col. 10 lines 30-35). Therefore it would be obvious to one skilled in the art at the time of invention to modify the process of Arnold to provide a device with at least two exposed metal lines in order to vary thickness and etch rate of the two exposed metal lines.

Arnold teaches forming a polymer by HDP. However Arnold does not teach performing a process on said semiconductor device, wherein said process is defined by a plurality of parameters. However Nulty teaches a plurality of parameters, comprising: a source power magnitude, a bias power magnitude, a pressure, duration, and a process gas flow rate (col. 1 lines 58-65). Therefore it would be obvious to one skilled

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in the art at the time of invention to modify the process of Arnold by having a plurality of process settings in order to achieve the desired etch characteristics.

Claims 1-6, 14, 24, 29-32, 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robles (5,804,259). In re claim 1, Robles discloses a method of forming a semiconductor device comprising: providing a surface within the device, providing a first feature on the surface, providing a second feature on the surface, and forming a polymer between the first and second feature in HDP environment (abstract).

In re claim 2 and 14, Robles discloses modifying said polymer within said HDP (col. 16 lines 49-65).

In re claim 3, Robles discloses that the step of modifying said polymer further comprises etching a portion of said polymer (col. 16 lines 41-45).

In re claims 4 & 5, Robles discloses that the first and second feature comprises of metallic feature or metal (col. 16 lines 1-10).

In re claim 6, Robles discloses that the first feature is a first metal line and the second feature is a second metal line (col. 16 lines 1-10).

In re claim 24 with the limitations of claim 23, Robles discloses providing a HDP etcher (col. 9 lines 42-45).

In re claim 29, Robles discloses a method of selectively forming a polymer by providing a device with exposed protruding features; providing an etcher having HDP settings comprising of: a source power setting, a bias power setting and a flow rate setting and exposing said device to a HDP process within said etcher (fig. 1 & 2, col. 9 lines 50-60 col. 16 lines 40-47).

In re claim 30, Robles discloses defining at least one recess, filling said recess with said polymer, and restricting formation of said polymer to within said recess (col. 16 lines 40-47).

In re claim 31, Robles discloses that at least one recess with said features comprises defining a recess between 2 protruding features of said plurality of protruding features (fig. 7a/7b).

In re claim 32, Robles discloses step of restricting formation of said polymer to within said recess further comprises preventing a formation of said polymer above said 2 protruding features (ref. 410).

In re claim 39, Robles discloses providing a HDP plasma and forming a polymer between metal lines (claim 1, fig. 7a).

### ***Response to Arguments***

Applicant points out that the Preliminary Amendment provides support on types of polymer in order to overcome the 101 rejection. The Preliminary Amendment states that "the plasma-deposited material can comprise polymers including (but not limited to) carbon and either a halogen and/or hydrogen or various other material" in order to illustrate types of polymers. The plasma-deposited materials can comprise of polymers but it could comprise of various other material.

Applicant argues that the disclosure of numerous combinations allowed by the process parameter ranges and material/device alternatives provides support for "forming a polymer." The discussed parameters only provide support for etching, not for forming a polymer.



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**Conclusion**

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

"A comparison of HDP Oxide and Spin-on Polymer for Intermetal dielectric applications in sub-half micron devices", Zheng et al., DUMIC conference, 2/10/97.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0957. See MPEP 203.08.

Any inquiry concerning this communication from the examiner should be directed to Lisa Kilday whose telephone number is (703) 306-5728. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo, can be reached on (703) 308-1233. The fax number for the group is (703) 305-3432. MPEP 502.01 contains instructions regarding procedures used in submitting responses by facsimile transmission.

Lisa Kilday

LAK

10/21/02

  
**EVAN PERT**